New Insight Into a Clinging Vine

Researchers have discovered the mechanisms a problematic weed uses to overrun and secure itself to crops and fences or other structures.

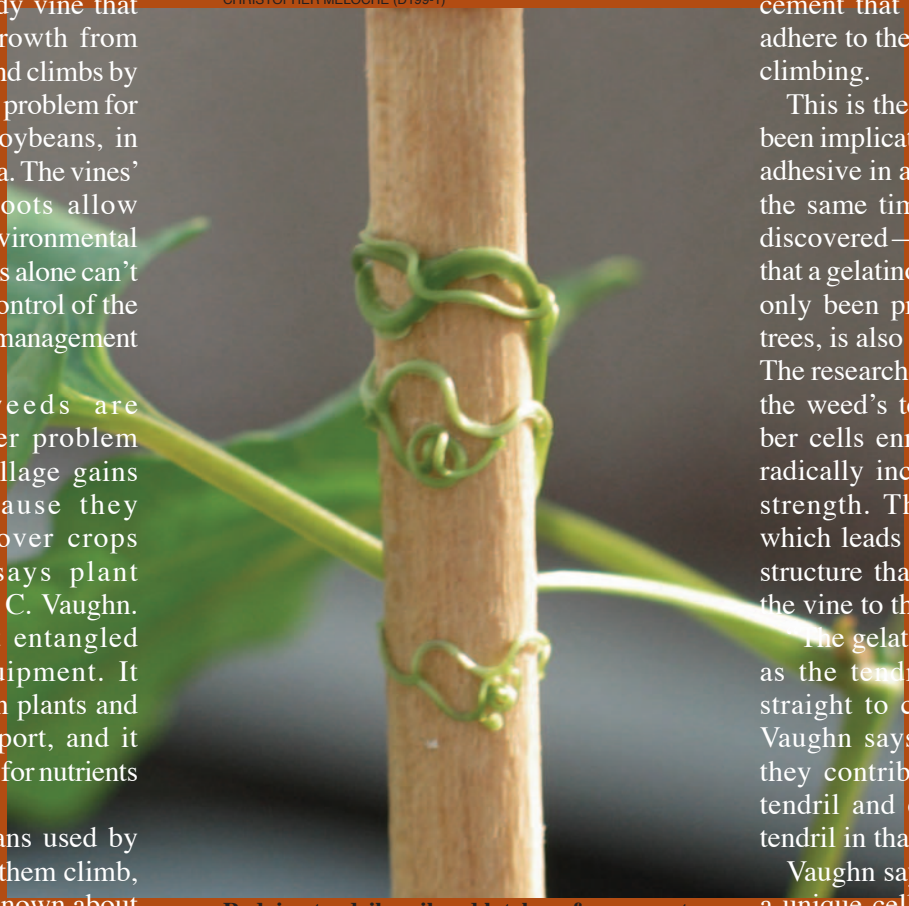
Redvine *(Brunnichia ovata)* is a perennial woody vine that regenerates new growth from woody rootstocks and climbs by its tendrils. It's a big problem for crops, especially soybeans, in the Mississippi Delta. The vines' extensive, deep roots allow them to survive environmental extremes. Herbicides alone can't provide complete control of the vines, so additional management tactics are needed.

"Perennial weeds are becoming a bigger problem as conservation tillage gains acceptance, because they persist despite cover crops and mulches," says plant physiologist Kevin C. Vaughn. "Redvine can get entangled in harvesting equipment. It grows over soybean plants and uses them for support, and it competes with them for nutrients and sunlight."

Tendrils are organs used by some vines to help them climb, but little has been known about how they develop or support the vine. At the Southern Weed Science Research Unit in Stoneville, Mississippi, Vaughn and Christopher G. Meloche, a postdoctoral scientist, discovered two unique aspects of redvine tendrils: A compound that sticks the tendril to objects and a unique fiber cell that is involved in both coiling and final stiffening of the tendril.

Redvine tendrils begin growing out of the shoot straight, thin, and flexible. Vaughn and Meloche discovered that when the vine encounters something to climb, epidermal cells along the length of the tendril expand in response to touch by elongating in the direction of the stimulus. The tendrils as a whole respond by coiling around the object for support. Cells enriched with phenols break apart as the tendrils rub against the object. Then the phenols react with an enzyme, polyphenol oxidase (PPO), to produce a sticky cement that the tendrils use to adhere to the surface the vine is climbing.

CHRISTOPHER MELOCHE (D199-1)



Redvine tendrils coil and latch on for support.

This is the first time PPO has been implicated in generating an adhesive in a climbing plant. At the same time, the researchers discovered—in another first—that a gelatinous fiber, which has only been previously found in trees, is also at work in redvine. The researchers determined that the weed's tendrils produce fiber cells enriched in lignin to radically increase the tendrils' strength. Then the cells die, which leads to a dry, rigid coil structure that securely anchors the vine to the support.

"The gelatinous fibers appear as the tendrils convert from straight to coiled structures," Vaughn says, "indicating that they contribute to coiling the tendril and eventually fix the tendril in that position."

Vaughn says they have found a unique cell wall composition with this newly discovered process. They are beginning to look at steps in the metabolic pathways related to this fiber production that they might inhibit to control redvine.—By **Jim Core,** ARS.

This research is part of Crop Production and Quarantine, an ARS National Program (#304) described on the World Wide Web at www.nps.ars.usda.gov.

Kevin C. Vaughn is in the USDA-ARS Southern Weed Science Research Unit, 141 Experiment Station Rd., P.O. Box 350, Stoneville, MS 38776; phone (662) 686-5211, fax (662) 686-5422, e-mail kvaughn@ars.usda.gov. ✸